



Abstract of the Disclosure

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A high temperature reaction apparatus and ^{method}~~method~~ employing radiation to heat and react on matter, such as one or more fluids containing one or more reaction materials in gaseous molecular and/or particulate form. In a preferred form, one or more high temperature plasmas are formed across one or more pairs of electrodes which define a single or a plurality of plasmas and a single or plural reaction zones. A stream or streams of fluid particles pass through such reaction zone or zones and all or select of the particles or molecules thereof are heated to a high temperature sufficient to effect a select chemical and/or physical reaction or a plurality of high temperature reactions involving a plurality of reaction products which are separated from each other downstream of the reaction zone or zones. The apparatus and method may be used to separate select atoms from molecules of a gas or gases passed through the reaction zone or zones by breaking the bonds between the atoms of the molecules of the gas. Selected of the resulting atoms may be collected in separate streams thereof, deposited on a substrate ^{such}~~such~~ as a substrate in movement, to coat or carry same away from the reaction chamber or ^{subject same}~~subjected~~ to further processing such as the formation of coatings, the molding ^{or}~~or~~ combining of such atoms with other atoms in a further chemical process. Synthetic diamond films or particles may be so formed from carbon atoms separated from carbon atom containing molecules of a gas fed to a reaction zone defined by a plasma arc and/or microwave heating. The heat of one or more of the plasmas or microwave energy directed at the surface to be coated with synthetic diamond formed of such gas separated carbon atoms may also be employed to effect the formation of such synthetic diamond film on such surface. In other forms of the invention, the apparatus and method may be employed to heat particles of metal containing ore to separate atoms of the metal or metals of such ore from the remaining ore material and to separate select atoms of molecules of waste gas of combustion and/or chemical processes, such as atoms of carbon from oxygen of gases such as carbon monoxide, carbon dioxide and other hydrocarbons.

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